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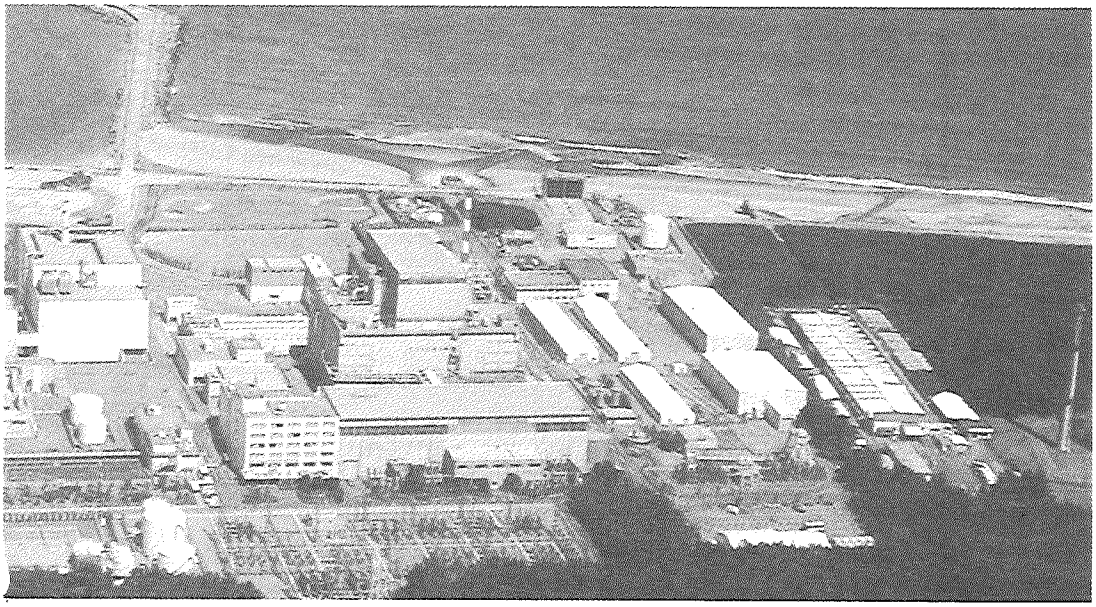
Tokai GCR to Be Decommissioned But What About the Waste?



Tokai I (GCR), Ibaragi Prefecture

IN THIS ISSUE

On June 28, the Japan Atomic Power Company (JAPCO), formally decided that it will end commercial operation of the Tokai nuclear plant, probably at the end of March 1998 and begin decommissioning it. It will be the first of Japan's commercial reactors to go. The company plans to decommission the plant, by first removing the spent fuel over four or five years, allowing the reactor to cool down for five to 10 years, and then dismantling the plant over about five years.

From the beginning of commercial operation in July 1966, the Tokai plant has had

an average capacity factor of 62 percent. Last year problems occurred on seven occasions. It was out of service for the whole of 1993 to replace a low-pressure turbine, which shows how aged the facility is. Decommissioning a 30 year old plant makes good sense but dismantling and disposal present a plethora of problems.

Tokai is a graphite-moderated gas-cooled reactor (GCR), which is an uncommon design worldwide and one of a kind in Japan. As such there are few known techniques available for dismantling such a reactor. Because JAPCO will have to develop dismantling techniques as it goes along, will everything really go all right? The company thinks that it will cost 25 billion yen to dismantle the plant, excluding the cost of managing the wastes (construction costs were 46.5 billion yen at 1966's value). What will JAPCO do with the huge amount of radioactive and non radioactive wastes that will be generated, including the graphite that is thought to be highly contaminated? A plethora of problems await.

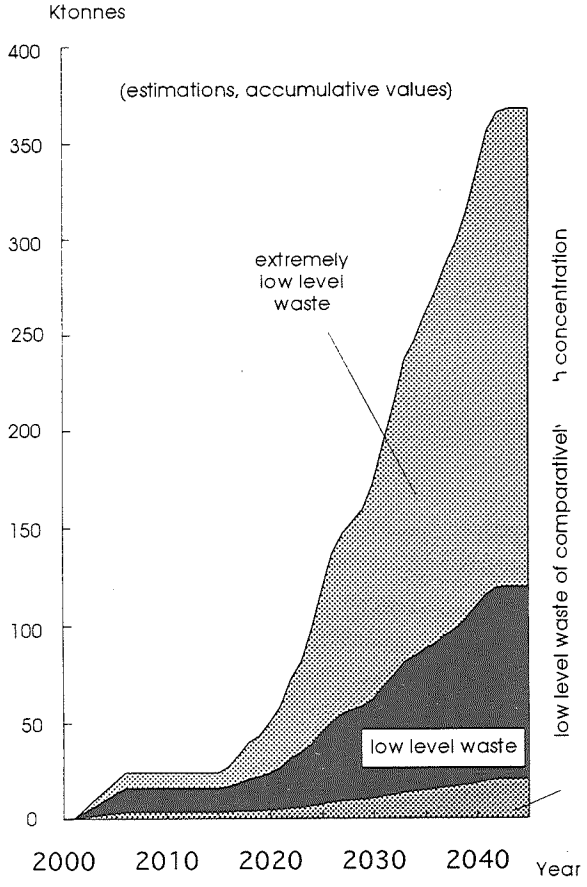
Radioactive Waste and BRC

On June 17, shortly before the decommissioning plan was announced, the Agency of Natural Resources and Energy, which is under the administration of the Ministry of International Trade and Industry (MITI), released an estimate of how much waste dismantling Tokai would generate. As shown in the table, the Agency calculated the waste generated and classified it into four categories according to the radiation level: (1) No need to treat as radioactive waste or BRC (beyond regulatory control), (2) equivalent to very low level radioactive waste, (3) equivalent to low-level radioactive waste and (4) equivalent to low-level radioactive waste of a comparatively high concentration.

The first category is a vague one with no clear criteria that might allow such waste to be treated as ordinary industrial waste (without any regulation). This could cause a great deal of difficulty.

Until now the idea has been that wastes generated inside radiation control areas are all radioactive but the Nuclear Safety Commission (NSC) has allowed that low-level wastes could perhaps also be treated as category (1) above. However, no decisions have been made on criteria or how to verify the type of waste and the electric utilities are doing all they can to reduce disposal costs they will have to bear for the huge amount of concrete waste that will be generated by gradually broadening the interpretation of what comes below the BRC category level.

Radioactive Waste Produced by the Decommissioning of Nuclear Reactors



Dismantled Waste Mountains

Figures from the table were used to calculate the cumulative amount of radioactive waste that will be generated by dismantling nuclear power plants (see figure). Assumptions were a 40-year operating time for light water reactors and 30 for gas-cooled reactors, a five-year cooling-down period, three years to dismantle light water reactors (this is probably too short but the figure of three years was taken from the "three to four years" in the Science and Technology Agency's pamphlet) and five years for gas-cooled reactors. The average amount of waste belonging to categories (2) to (4) generated annually was estimated over the dismantling period and only the 49 reactors (excluding Fugen) that were in commercial operation as of June 30, 1996 were considered.

The total will come to 170,000 tons by 2030, and if events proceed as assumed here, Japan will have to deal with a whopping 370,000 tons of radioactive waste after 2040, when all the currently operating nuclear plants have been dismantled and removed. This is still less than 2 percent of the total waste that dismantling will generate. (Kamisawa Chihiro)

Table. Decommissioning Wastes

Radiation Level Categories	Percentage Breakdown	
	Light Water Reactors	Gas Cooled Reactor
No Need to Treat as Radioactive Waste	97-99%	85%
Equiv. of Extremely Low Level Waste	1-3%	5%
Equiv. of Low Level Waste (LLW)	Less Than 1%	Less Than 10%
Eq. of LLW of Comparatively High Concn	Less Than 0.1%	Less Than 2%
Total Quantities of Waste Generated	1,100MW Class: 500-550 Ktns	160MW Class: 160Ktns
	800MW Class: 200-250 Ktns	
	500MW Class: 150-200 Ktns	

Table is from the Advisory Committee on Energy's sectional meeting on nuclear reactor decommissioning.

Monju Sodium Leak. Increasing Doubts over STA's Fact-Finding Efforts

Since the Monju accident the Power Reactor and Nuclear Fuel Development Corporation (PNC) has released three accident reports and the Science and Technology Agency (STA), two. On June 7, PNC conducted a second sodium leak and combustion accident test at its Oarai Engineering Center under conditions identical to the accident.

STA's internal task force conducting the accident investigation, includes; PNC, the Japan Atomic Energy Research Institute (JAERI), and the National Research Institute for Metals. All are STA controlled.

This article will discuss the reports and ask some questions that need answers.

The sodium leak was estimated at 0.7 tons, a figure that was calculated from the area of the rupture, the secondary system pressure, the leak's duration and from test results using water that were converted to the sodium equivalent.

STA concluded that the thermocouple sheath broke because of a design error by the

manufacturer, Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) and STA's report gives the following explanation. PNC asked IHI to give the thermocouple's sheath a uniform thickness so that it would have a good thermal response. Thus, as prescribed by the drill bit angle used when making the sheath, it had a joggled shape that narrowed sharply. While they were able to avoid vibration caused by Karman's vortex, resonant vibration was instead caused by a symmetrical vortex. STA says that four people at IHI worked on the thermocouple design, but none was a specialist in fluid dynamics.

This design error escaped notice not only at IHI but also at Toshiba that built the secondary system, and at PNC. Since STA's safety screening did not include instrumentation and control systems there was no check during that screening either. In addition, the inadequate references to the accident cover-up and the limiting of the accident's investigation to those involved (the STA clan) has been laid bare.

By correlating observations of the broken surfaces, the results of fatigue experiments on a thermocouple in water and Monju's operational record, STA has speculated that the crack first appeared in the thermocouple between April and June 1992. By March 1995 the crack had passed right through the metal and over half way around the circumference.

Because the 7 percent flow rate between March 1993 and October 1994 had no bearing on the accident, it is possible that the crack had passed all the way through the metal before May 1993. Whatever the case, it would have done so quite some time before the accident.

In March, CNIC formed the Committee for the General Evaluation of the Monju Accident(CGEMA), composed mainly of researchers. On June 17 Committee members talked with STA, who claimed that in the first water experiment the thermocouple broke so quickly that it was impossible to get any data, so the experiment was done over. In the second experiment, conducted at a flowrate of 5.5 m/s, the thermocouple cracked after 215 hours.

When checked by ultrasound, the other secondary system thermocouples were found to be uncracked. Why only one thermocouple cracked has not been explained and the reports say this is a problem yet to be solved.

The leaked sodium melted parts such as a ventilation duct and a catwalk, and was piled up on the floor. A major issue here is the temperature attained at that time. This is because under the safety screening that anticipated sodium leaks, analysis results say the floor temperature must not exceed 400 C.

The reports say that Monju's floor reached 700 to 750 C, but did not melt. STA makes this claim because it exposed metal of the same composition to high temperature and compared the metal surface to that of Monju. But, this very experiment proves that the assumptions made for the safety review of Monju were too optimistic.

Moreover, On June 7, PNC reproduced the accident experimentally in a chamber 1/13th the size of the original but with pipes and ducts arranged identically to Monju. It even used about the same amount of oxygen. Approximately 690 kg of sodium were released over about 4 hours. The result was far grimmer than the experimenters anticipated. Six holes of various sizes were melted into the 6-mm steel floor plating. The largest hole was 20 cm in diameter. If the STA's experimental conditions had been slightly different, it could have shown that Monju's steel floor liner also would not have served as protection against leaked sodium. STA had not anticipated this situation at all.

With the accident and its cover-up having been revealed, the public is more vociferous than ever in calling for freedom of information. Although STA and PNC have both promised to do so, concrete information has yet to be released despite the public demands for it.

(Hideyuki Ban)

An Anti-Nuke Mayor at Suzu City Is Not to Be

On 14 July 1996, a mayoral election was held in Suzu City, Ishikawa Prefecture. The election was a rerun of the April 1993 mayoral election invalidated by the Supreme Court, on 31 May 1996 because of irregularities. Once again the anti nuclear power plant lobby supported Mr. Junichiro Kashida, an ex-principal of an elementary school. Unfortunately he lost to Mr. Osamu Kaizo, ex-chief of the general affairs section of Suzu City office and successor to the invalidated mayor.

Suzu City is in the Hokuriku Electric Power Co.'s service area and both the Kansai and the Chubu Electric Power Co.s are planning to build new nuclear power plants in the city with the support of Hokuriku Electric. The plants' construction was the biggest issue in the April '93 elections and the nuclear power supporters were thought to be at a disadvantage because of the rise in support for the anti nuclear power plant movement. So they won over the city office staff and even the election administration, to their side. They have used every underhand means to win the election. As a result the pro plant candidate, the then incumbent mayor of Suzu City, was elected but only by a majority of 900. But the citizens of Suzu City contested the result and the High and the Supreme Courts ruled in their favor.

In the rerun election, the power plant supporters avoiding the nuclear power plant issue completely. Instead they campaigned for "a stable city administration." They won the sympathy vote from those who felt sorry for the unseated ex-mayor. This time they won by a majority of 1800 without showing their hand as plant supporters. The day after the vote the city office was searched by the police and the deputy mayor was arrested for election offenses. Abusing his position, he had approached the staff of the city office for support for the candidate Mr. Kaizo. The citizens there are enraged, crying, "When will we be free of injustice!?" An opinion cited in a newspaper said "Resign new mayor and deputy mayor!"

During the election campaign many newspapers conducted opinion polls. According to them, opinion is more anti than pro the plant. Clearly, public opinion about the construction is not completely reflected in this result. Even the new mayor, Mr. Kaizo, admitted this. He said, "it is true that the majority of people are against the plants' construction, an election is different from a local referendum." He made clear that he will consider the construction issue more carefully.

It can be said that this election clearly shows the necessity for a local referendum. It is difficult to make a decision about nuclear power plant problems by way of an election. When a single issue can greatly affect people's lives then a vote on just that issue, a referendum, is needed.

On 4 August 1996, the first local referendum in Japan on a nuclear power plant's construction, will be held in Maki town, Niigata Prefecture. The Tohoku Electric Power Co. is planning to construct a nuclear power plant in this town. The Tokyo Electric Power Co. (TEPCO.) and other electric power companies are rushing to the town to help the plant supporters. Government officials, The Liberal Democratic Party, The New Frontier Party and other political parties are running campaigns to get the power plant approved. They are offering visits to other plants that are a pretense to give away discounted trips to hot spring hotels. They are holding study meetings with food and alcohol laid on. They are producing celebrity concerts and talk shows. In a regular election they would be arrested for election offenses. These activities are rampant and uncontested. However they indicate how seriously the anti nuclear movement is taken.

Siberian Nuke Center Lacks Safety & Safeguards

J. Takagi

I attended the Third International Radio-ecological Conference: Fate of Spent Nuclear Fuel, in Krasnoyarsk, Siberia (23-27 June). The conference was mainly to discuss the wisdom of building RT-2, a huge reprocessing plant at Krasnoyarsk-26, a closed Siberian town. It was a very interesting conference with speeches from both sides of the reprocessing debate and some useful discussions between them. Also presented were interesting observations of radioecological contamination due to the Krasnoyarsk-26 nuclear complex MCC (Mining Chemical Combine). Details will be published by the organizer soon.

This is a brief report on our visit to the RT-2 (MCC) facility, made possible by the effort of the conference organizers.

It was a very strange yet interesting trip. From Krasnoyarsk, it was an hour's bus ride to the closed town. It took another hour to enter the RT-2 facility, due to engine trouble and repeated gate controls. Not surprisingly photographing the facility from outside and even the landscape during our bus ride was forbidden. But, amazingly, there was no control of photography inside the facility.

At present there is only a spent fuel storage pool but it really shocked me as safety and nuclear material controls were almost non-existent. After putting on a hat and raincoat-like overgarment and changing shoes, we were directly admitted to the spent fuel storage pool. We were on the huge pool cover that had apertures here and there. I have been to many spent fuel storage pools but nowhere was I allowed to behave like this. People stepped over apertures that had no warning signs even though 1500 VVER-1000 (Russian PWR) spent fuel assemblies (one fourth of capacity) were in the pool.

Our guide, Y.G.Fedosov, deputy chief engineer of RT-2, said later that the radiation intensity at the floor (cover) level would be about 5 R/sec if there was no water in the pool. This might be the dose rate one would be exposed to if one fell into the water. Near the crane controls hung a life belt that seemed to be the only safety device.

In a corner of the room were two models of VVER-1000 fuel assemblies. Mr. Fedosov stood just in front of them, explaining them to us at length and touching them but a small GM counter we had brought indicated the radiation level of the models was 1.5 to 2 mR/h, 200 times as high as the background level.

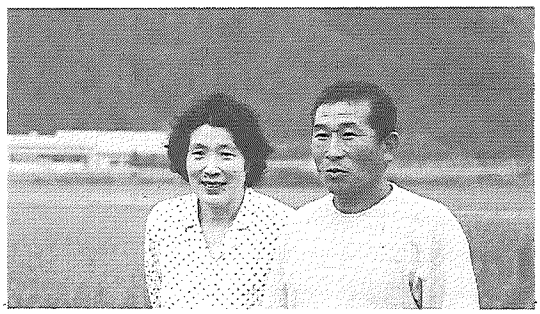
Skeptical of RT-2's safety controls, I took five paper smear samples in the room. When I measured them in Tokyo, four samples were contaminated with alpha and beta activity. Though my measurement was not precisely quantitative, I tentatively estimated that the floor contamination level was around 1 Bq/cm^2, which is just below the allowable surface contamination level for alpha emitters in a radiation control area in Japan.

The most surprising thing at RT-2, was the perfect lack of nuclear material control or safeguard. When we left the radiation control area which is supposed to be safeguarded, a so-called MBA (material balance area), there was no control at all. Had there been a SNM (special nuclear material) like plutonium or HEU inside, we could have easily taken it out.

Of course the spent fuel is too hot to carry out, but nuclear material control should not be done that way. I assume that RT-2 has the usual chemical analysis laboratories etc. and there may presumably be SNMs inside the area.

I was really frightened. RT-2 and the whole MCC facilities invite proliferation of nuclear materials. The safeguard situation in Russian nuclear facilities urgently needs improving.

Anti-Nuke Who's Who:
Mr. Mikio Shimaoka of Kubokawa Town



Mr. and Mrs. Mikio Shimaoka of Kubokawa town

In 1977, in Kubokawa town (pop. 19,000), Kochi Prefecture, on the Pacific coast of Shikoku, a struggle over an N-plant construction plan began.

In 1979, an anti-nuke mayor, Fujito, was elected, but he reneged on his promise after a year and a half and began pursuing N-plant construction. At the same time, a pro nuclear body was formed. It submitted a petition to Shikoku Electric Power Co. (SEPCO.) from local residents asking SEPCO. to "research into building nuclear power plants in Kubokawa town." In response, the anti nuclear side collected 50% of the local voters' signatures for a petition to the council, saying, "we are positively against N-plants in Kubokawa."

A prime mover in the anti nuke movement was Mr. Mikio Shimaoka, an ex-policeman and ex-head of the youth section of the town's Liberal Democratic Party. He is one of the key people of the town's conservative base.

Shimaoka had lost his mother to cancer a few years previously. He was shocked by the way her radiation treatment left her exhausted. He came to realize the fundamental danger of radiation to human health. Because he had allowed her to be treated with radiotherapy he felt responsible for her death. He remembered his mother when the N-plant plan was proposed in Kubokawa and decided he could never allow the construct of any N-plants in the town.

He said "citizens' movements are study activities." In the years that followed over 800 study meetings and rallies were held by the anti nuclear movement. It is an amazing number considering most of the participants and organizers were farmers and fishermen who came despite their hard daily work. The themes of the meetings were not only N-related. There were others, for example, on democracy, the town council, infrastructural reform of agriculture, education, culture and welfare. They organized research trips around Japan and even to Three Mile Island, unlike the N-industry financed trip organized by pro-nuclear side.

Despite the anti N-plant petition the town council decided to approve the research plan. The anti nuclear side urged the mayor to enact a referendum to seek approval for the research. He refused so they decided to recall him and after a hard struggle succeeded in 1981. But he was re-elected at the next town mayor election with the help of the pro nuclear side's vote buying operation. To help win over the undecided voters Fujito promised a town ordinance for a referendum if elected. Despite Fujito's re-election Kubokawa was the first town in Japan with an ordinance on N-plant construction.

Early in the next year, a town council election was held and Shimaoka stood as a candidate. Ten anti-nuke councilors, included Shimaoka, were elected out of a council of 22. This was double the previous number.

After the Chernobyl accident in '86, the anti-nuke side gained influence and a pro-nuke councillor changed his position and, finally, in 1988, Fujito called for the N-plant plan to be ended and resigned. An anti-nuke mayor was elected after Fujito's resignation and the new town council sought a finish to the plan. Thus, ended Kubokawa's nuclear battle. But Councilor Shimaoka still speaks on Kubokawa's long fought campaign. (Mika Obayashi)

DATA Significant Incidents at Nuclear Plants

(July to December 1995)

Date	Plant	Short description of event
Jul. 7	Ohi 1	Steam leaked through a side tube attached to main feedwater piping; reactor manually shut down.
Jul. 12	Mihama 3	Power dropped due to failure of water amount adjustment in feedwater heater during test operation.
Jul. 12	Kashiwazaki-Kariwa 4	Reactor manually stopped due to turbine control oil leakage from piping near turbine by-pass valve.
Jul. 31	Fukushima I-5	Power dropped due to drop in water flow rate in circulating water pump.
Aug. 24	Mihama 3	Marine organism found in emergency diesel generator cooler; the generator removed from line.
Aug. 24	Takahama 2	Marine organism found in emergency Diesel generator cooler; the generator removed from line.
Aug. 25	Ohi-4	Reactor shut down due to damage of thermometer tube attached recently to coolant piping.
Aug. 30	Takahama 2	Electricity leak in auxiliary feedwater pump.
Sept. 1	Mihama-1	Power dropped due to clogging of condenser.
Sept. 12	KUR-1	Reactor start suspended due to electric circuit malfunction.
Sept. 13	Rokkasho	Some centrifuge units stopped due to human error during Enr. Plant power source inspection.
Sept. 17	Fukushima I-3	Power reduced due to circulating water pump flow rate drop.
Oct. 12	Mihama 3	Reactor manually shut down due to coolant leak from reactor water level meter housing.
Oct. 19	Tokai Reproc. plant	Radioactive leak into steam piping in evaporator.
Oct. 24	Tokai 1	Control rod erroneously inserted due to breach of CRD drive wire rope (during test operation); reactor manually shutdown.
Oct. 25	Ohi 2	254 steam generator tubes found damaged.
Oct. 27	Ohi 1	Power dropped due to false operation of condenser water discharge valve.
Nov. 10	Fukushima II-3	Detector found detached from power range monitor during periodic inspection.
Nov. 20	Tokai Reproc.	Radioactive leak in sampling operation room.
Nov. 25	Fukushima I-6	Reactor tripped due to high sump water level in containment.
Nov. 27	Hamaoka 3	Fire in turbine building
Dec. 4	Hamaoka 1	Reactor manually stopped due to increased water discharge from containment cooler
Dec. 8	Monju	Sodium leak from secondary coolant piping.
Dec. 24	Tokai I	Generator tripped due to sea water leak to main condenser.
Dec. 24	Onagawa 2	Reactor manually shut down due to steam leak from near control valve of moisture separator reheater.

NEWS WATCH

Meeting Held to Introduced ASIATOM Idea

The Asia Nuclear Safety Congress (provisional name), proposed by Prime Minister Ryutaro Hashimoto at the Nuclear Safety Summit in Moscow in April, is expected to be held in November in Japan. The Nuclear Safety Commission will begin discussions in earnest on Japan's cooperation with Asian countries in the fall at its Specialist Section on International Cooperation.

Under such circumstances the Study Group on Nuclear Disarmament and Nuclear Diplomacy under the Japan International Forum compiled a report on its scheme to establish an "ASIATOM." The Forum is a nonprofit corporation set up in 1987. Its board chairman is Professor Kenichi Ito of Aoyama Gakuin University. There are 60 corporate and 100 individual members on the Forum, many of whom are politicians and scholars of international politics and economics. The president is Professor Kumao Kaneko of Tokai University, who was chief of the Foreign Ministry's Nuclear Energy Division.

The major aims of ASIATOM are (1) to achieve safety of nuclear power generation and (2) to secure nuclear nonproliferation and to safeguard nuclear substances. In the early phases the group put more weight on the former and the target membership is said to be APEC as well as NPT member countries.

A meeting was held to introduce the report on July 4 in Tokyo. People from the electric companies, the nuclear industry and the government attended with keen interest. However, the report does not explain clearly how to guarantee nuclear nonproliferation. Some people saw potential problems, like; the difficulty in gaining international agreement for the framework to promote nuclear power in Asia where political situations differ from country to country, or whether Asia really needs nuclear power. This exposed the Japanese-centered ASIATOM plan's weakness.

Municipal Governments Stock -pile Iodine, Independently

In Fukui Prefecture, municipal governments within 20 to 30 km of nuclear plants have begun stockpiling iodine pills. Those located within 8 to 10 km of nuclear plants have been using subsidies from the national government to stockpile these pills, but the stockpile only covers 20 to 30% of the residents. As these pills are kept in places like public health centers, it is quite possible that they will not be evenly distributed an emergency. Claiming that they might be unable to protect their residents from a large-scale radioactive disaster, some municipal governments began independently to purchase iodine pills and store them in more accessible places, such as public halls, ward chiefs' homes and schools.

Imadate Town was first to do so. The town council decided on the plan in September last year, before the Monju accident and purchased the pills on December 26, after the accident. Takefu City decided to do the same in December and purchased the pills in June this year. Ikeda town council passed the budget bill for stockpiling in June. This move looks to spread further.

Anti-nuclear Shareholders Made Proposals at Power Co.s' AGMs

General meetings of shareholders of all power companies were simultaneously held on June 27. In Japan it is the usual practice for most companies, not only power companies to hold shareholders' meeting on the same day. This makes it impossible for one shareholder to attend more than one company's meeting and reduces the number of attendants so that the meeting can be finished as quickly as possible. This was originally conceived to prevent trouble from so-called "sokaiya" (professional troublemakers at shareholders' meetings), but naturally it infringes on the rights of shareholders.

Shareholders who are calling for nuclear phase out collected the minimum necessary number of shares and made proposals at various power companies' meetings. They proposed to recover the fund invested in Power Reactor and Nuclear Fuel Development Corp. (PNC) whose fast breeder reactor Monju had a grave accident, and to ban reprocessing of spent fuel, all of which, however, were rejected.

At Tohoku Electric Power Co.'s shareholders' meeting questions concentrated on the issue of the referendum concerning the company's construction plan for the Maki nuclear plant (see p. 1). The company said that it would refrain from making any comment the referendum at this stage. To the question about tours offered by the company to local people to other nuclear plants that included a stay at a hot spa, the company responded that it would not fall into a category of bribery. The proposal made by the anti-nuclear shareholders to add to the company's statutes the following paragraph was rejected: "If the referendum opposes the plan, the plan shall be canceled."

Ten Power Companies to Share Rokkasho Costs. 100 Billion Yen

At a press conference held on June 14 Chairman Hiroshi Araki of the Federation of Electric Power Companies disclosed that the power companies decided to pay a "share of construction costs" for the reprocessing plan that Japan Nuclear Fuel Industries, Inc. is constructing in Rokkashomura, Aomori Prefecture, and that by the end of March a total of 12.5 billion yen had been already paid. It is estimated that it will cost a total of 1,800 billion yen, 40%, or 750 billion yen, of which is to be funded by ten power companies. He said that the ten companies would pay into a fund a total of 12.5 billion yen per year for eight years. The remaining 650 billion yen will be funded in the form of advancement for commissioning reprocessing and a capital increase, but concrete details have not decided.

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